

1. INTRODUCTION

The purpose of the Sredna Vacha hydropower development is to make use of the energy potential of the Dospat-Vacha cascade part that remains undeveloped. The available potential is determined by:

- the available geodetic head between the town of Devin (altitude 685.00 m) and the full-supply level of Vacha dam (altitude 535.80 m); and
- an average perennial runoff of about $650 \times 10^6 \text{ m}^3$.

The Dospat-Vacha hydro complex provides for a multi-purpose utilisation of the water resources, viz. water supply, irrigation and electricity generation. The Dospat reservoir, with a storage capacity more than $400 \times 10^6 \text{ m}^3$, is the main storage of the scheme and serves for a perennial regulation of the runoff. The Dospat reservoir retains waters from the Mesta River catchment and through the Teshel HPP diversion transfers them to the Vacha river's valley. The Vacha reservoir provides for both the runoff seasonal regulation and the co-ordination between the different consumers of water.

The Sredna Vacha hydropower development is situated between the two above described reservoirs of the Dospat-Vacha cascade, which determines the possibility to be constructed and operated for hydropower purposes only. The studies so far carried-out proved that the optimal scheme of development is a one-staged scheme consisting of the Tsankov kamak hydroelectric project. The implementation of the scheme will make it possible to utilise more than 90% of the head available.

2. PROJECT DEFINITION

The Tsankov Kamak hydroelectric project will include the Tsankov Kamak reservoir, a diversion hydroelectric plant, and a water intake from the Gashnja river's valley.

A. TSANKOV KAMAK DAM AND RESERVOIR

Reservoir main characteristics:

- *Storage capacities*
 - total storage capacity 130 millions m^3 ;
 - active storage capacity 50 millions m^3 .
- *Characteristic elevations*
 - top water level (security 0.01%) 687.30 m;
 - retention water level 685.00 m;
 - minimum operating water level 668.00 m.

Main structures:

- *Dam* - RCC gravity dam with 125 m maximal height is considered.
- *Spillway* - Flood overtopping through dam body is realised by four-aperture spillway; equipped with radial gates.
- *Plugging of water loss points in Gashnja river valley.*

The relocating of the Devin-Mihalkovo road III-868, 17 km long, by reason of its situation on the Dam Lake, is an individual project.

B. HYDROPOWER STATION

The location of the powerhouse has been chosen in such a manner as to make maximum use of the available geodetic head for a single-stage scheme.

Structures:

- *Correction of Gashnja river*
- *Water intake structure* - situated on the left bank of Gashnja river's valley
- *Pressure diversion* - consists of a 60 m vertical shaft and a 500 m long head-race tunnel of a slight inclination.
- *Power house* - located in the bed of Vacha River. Two units, each consist of a Francis turbine on vertical shaft and a 3-phase synchronous generator, and auxiliary equipment shall be installed in the powerhouse. Installed capacity - 80 MW.
- *Tail race channel* - envisaged as a correction of Vacha river's bed.
- *Switchyard* - a 220 kV outdoor switchyard connected with the power transmission line 220 kV.

3. DURATION OF CONSTRUCTION

The optimal duration of the implementation of the project's main works is of the range 5 to 6 years.

The duration of the temporary and supplementary works, prior to the main works, is to be determined in function of the possibilities for financing of the project. Their minimal duration is 1 to 1.5 years.

4. PROJECT COST

The total cost of the Tsankov Kamak hydroelectric project with the capacity 80 MW, amounts to **USD 92.5 millions**.

The expenses for relocating of the Devin-Mihalkovo road III-868, 17 km long, are not included in this sum.

5. EFFECTS FROM THE PROJECT IMPLEMENTATION

A. EFFECTS WITHIN THE ENERGY SECTOR

The main effect from the implementation of the hydroelectric project will be in the energy sector of the country's economy. The electricity production, which is envisaged to cover the peaks in demand, will be of 185 GWh per annum.

The availability of the large reservoirs upstream and downstream of the Tsankov Kamak project gives the possibility of unplanned operation of the power plant, with duration of up to 5 days, to cover energy demands in emergencies.

B. EFFECTS BEYOND THE ENERGY SECTOR

The effects beyond the energy sector will consist in:

- Introducing in the Dospat-Vacha hydro complex of a new storage with capacity of 88 million m³. This will cause an increase of the complex's regulation coefficient and thus an increase of the utilised water volumes of about 20 million m³ annually. It must be mentioned that the waters to be regulated are of very good potable quality;

- The construction of a new, modern 17 km long road from Devin to Mihalkovo;
- Improvement the project region's infrastructure;
- Creating of job opportunities for about 3000 man-years during the project implementation period, as well as of 30 permanent job positions during the project operation period;
- The project is not so important in national plan, but it creates conditions for development of different branches in the country's economy in connection with the procurement of equipment, constructional materials, transportation, etc.
- Utilisation of environmentally friendly and renewable source of energy.

All this determines the Tsankov Kamak hydroelectric project as a financially appropriate one.

6. THE STATUS QUO OF THE PROJECT

The investment activities for the project implementation have not been completely stopped.

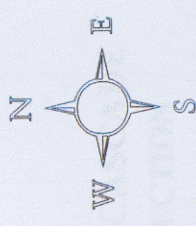
The project's status quo is the following:

- The preliminary studies have been carried-out. Final design reports have been completed for some temporary and auxiliary structures.
- Temporary access roads to the dam crest and to the entrance of the construction waters' diversion tunnel have been completed.
- An infrastructure on the dam site, providing for the implementation of civil works of about 5 millions DM/year, has been completed.

7. MAIN TECHNICAL AND ECONOMIC CHARACTERISTICS

The technical and economic characteristics of the Tsankov Kamak hydroelectric project are the following:

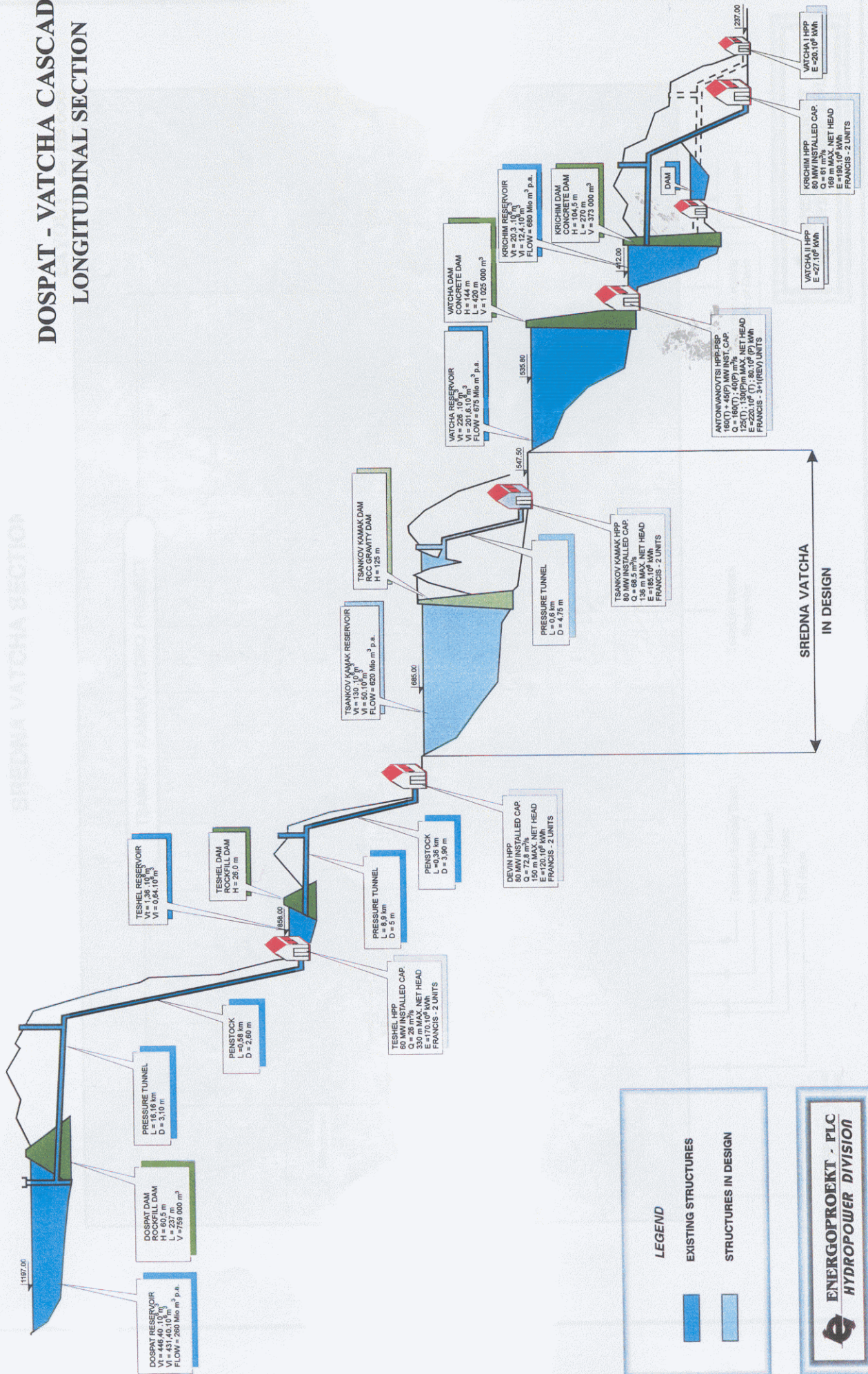
| Feature | Dimension | Value |
|---|--------------------------------|---------------|
| Average perennial volume of processed water | $10^6 \text{ m}^3/\text{year}$ | 580 |
| Flow rate | m^3/s | 68.5 |
| Maximum net head | m | 136 |
| Installed capacity | MW | 80 |
| Working hours per annum | hours | 2300 |
| Number of units (vertical-axis Francis) | each | 2 |
| Average perennial generation of electricity | GWh | 185 |
| Duration of construction | years | 5 |
| Capital cost of the project (01.11.2000) <i>The expenses for relocating of the road III-868 are not included</i> | million USD million BGL | 92.5 203.5 |



EXISTING STRUCTURES

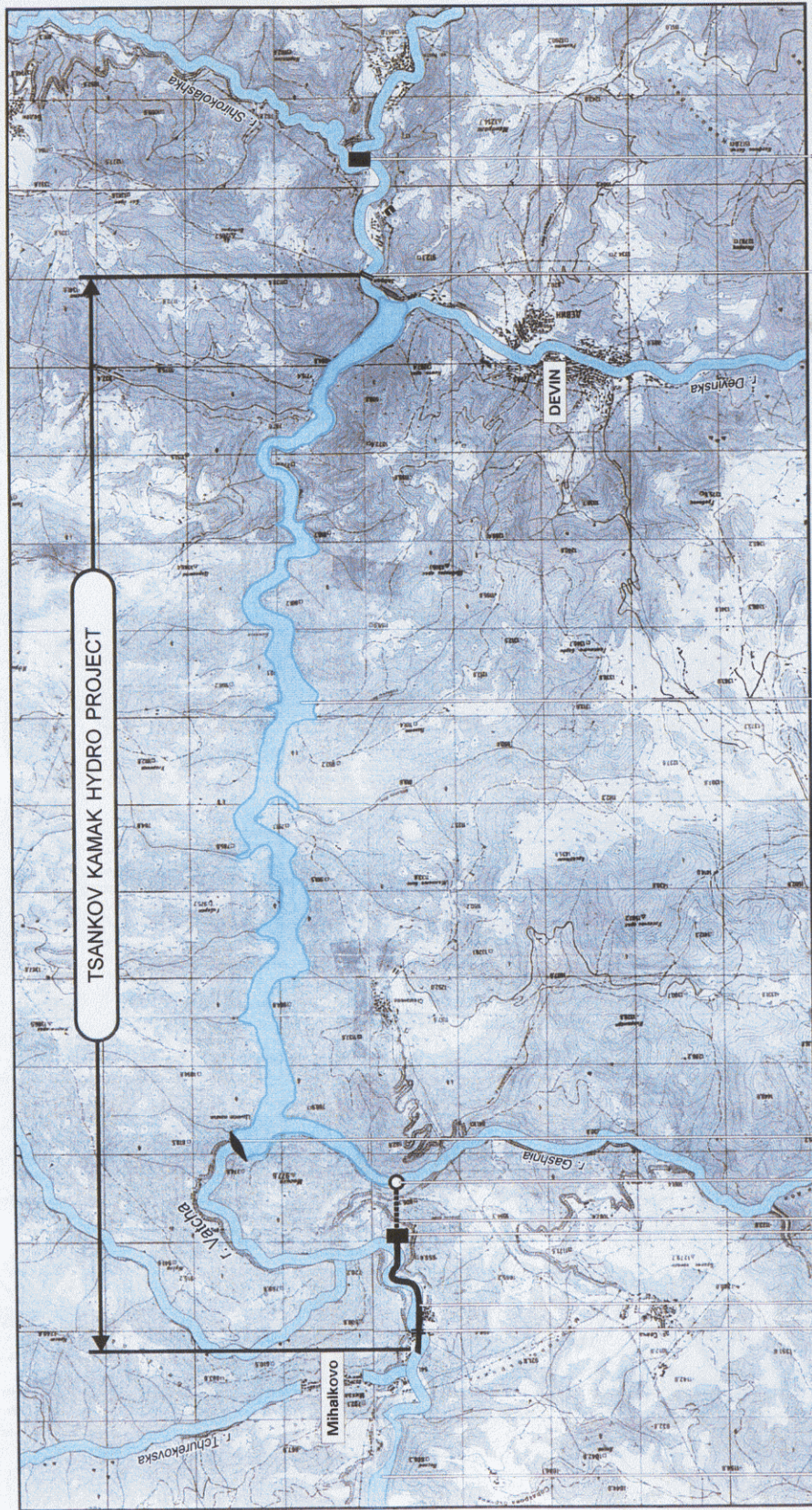
STRUCTURES IN DESIGN

DOSPAT - VATCHA CASCADE LONGITUDINAL SECTION



SREDNA VATCHA SECTION

LAYOUT So 1:75 000



Devin HPP

Bridge over r. Vatcha at the town of Devin

Tsankov kamak Reservoir

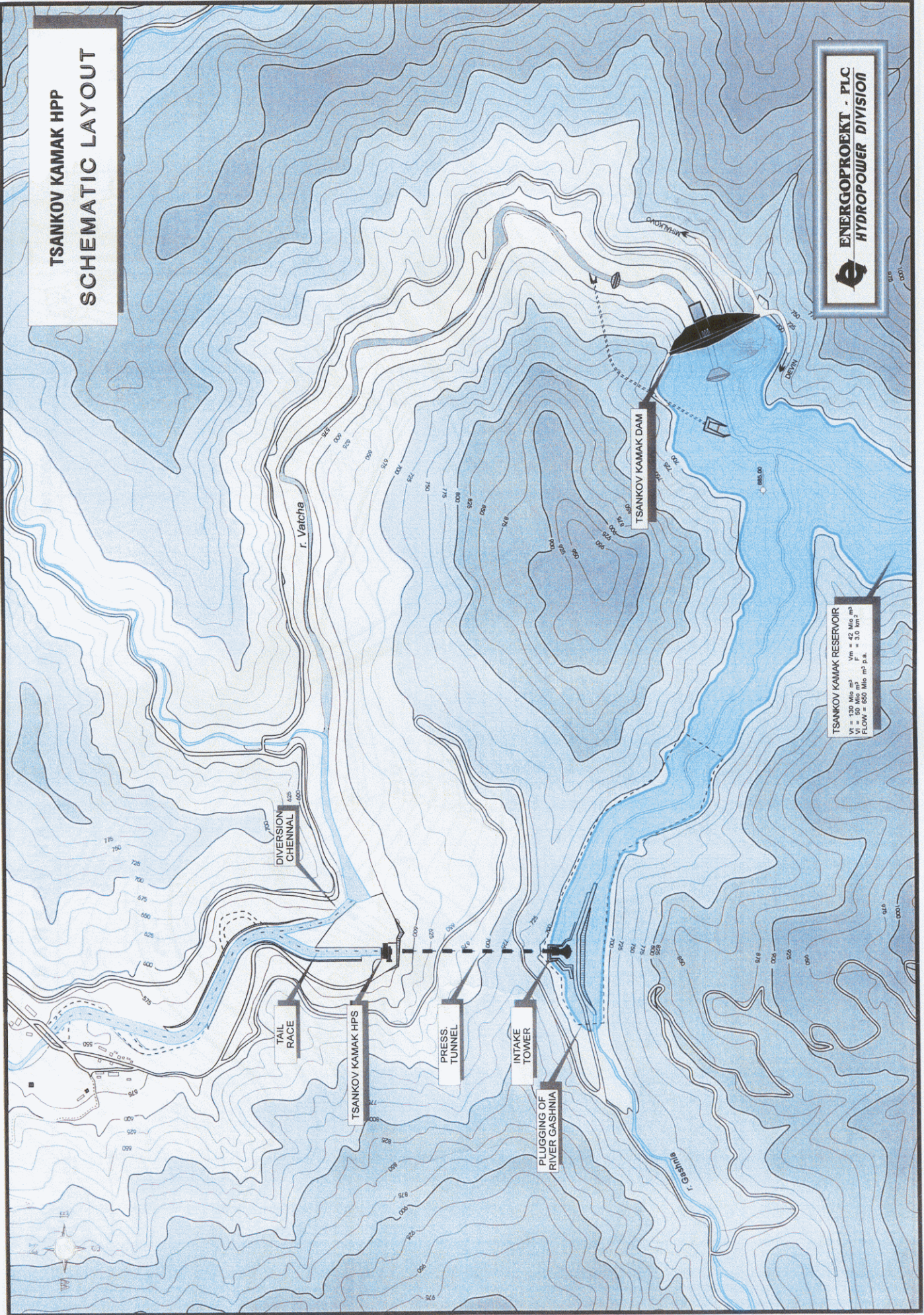
Tsankov kamak Dam
Intake Tower
Pressure Tunnel
Power House
Tail Race

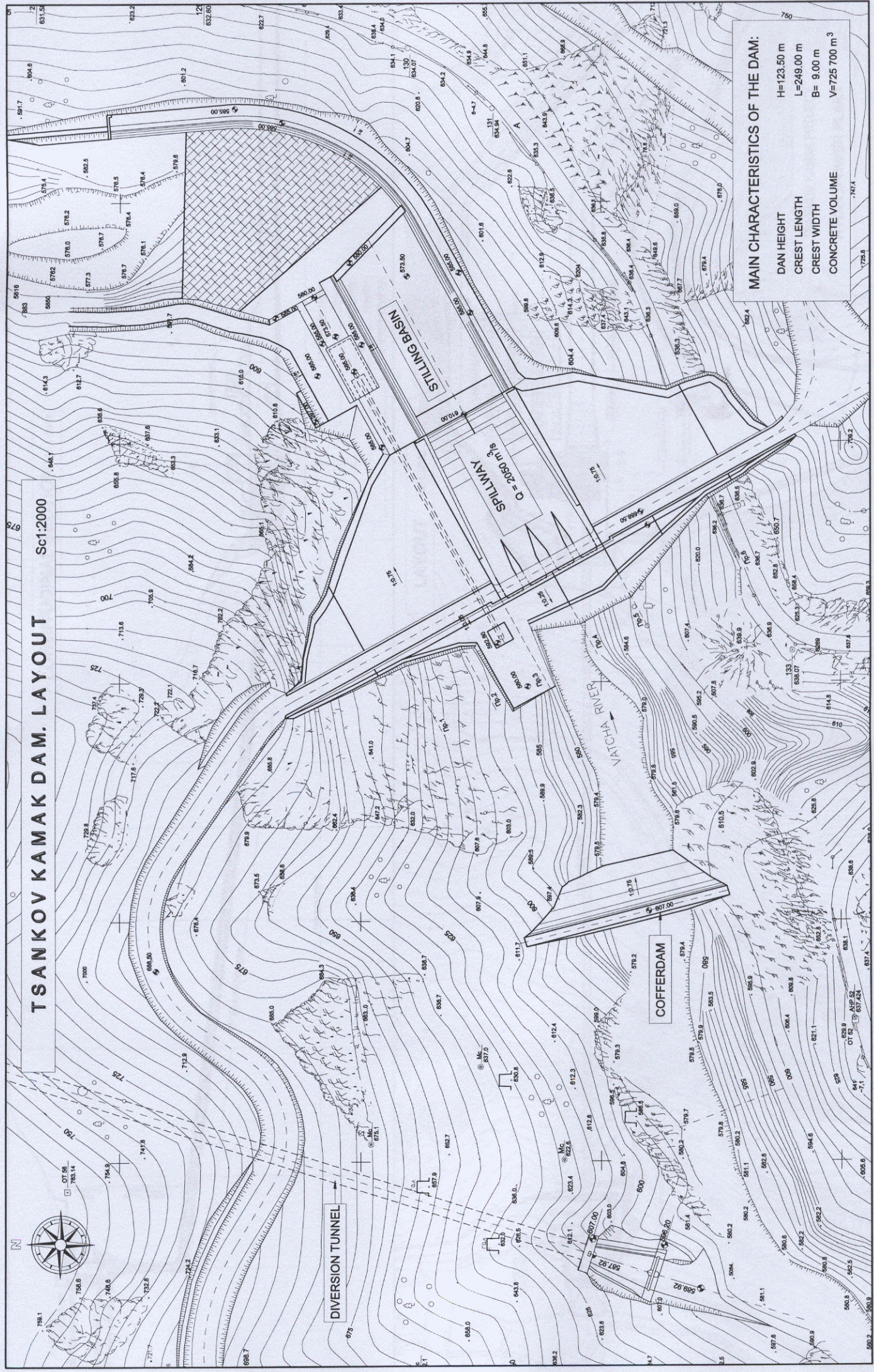
Bridge over r. Vatcha at Mihalkovo village

Antonivanovitsi Reservoir

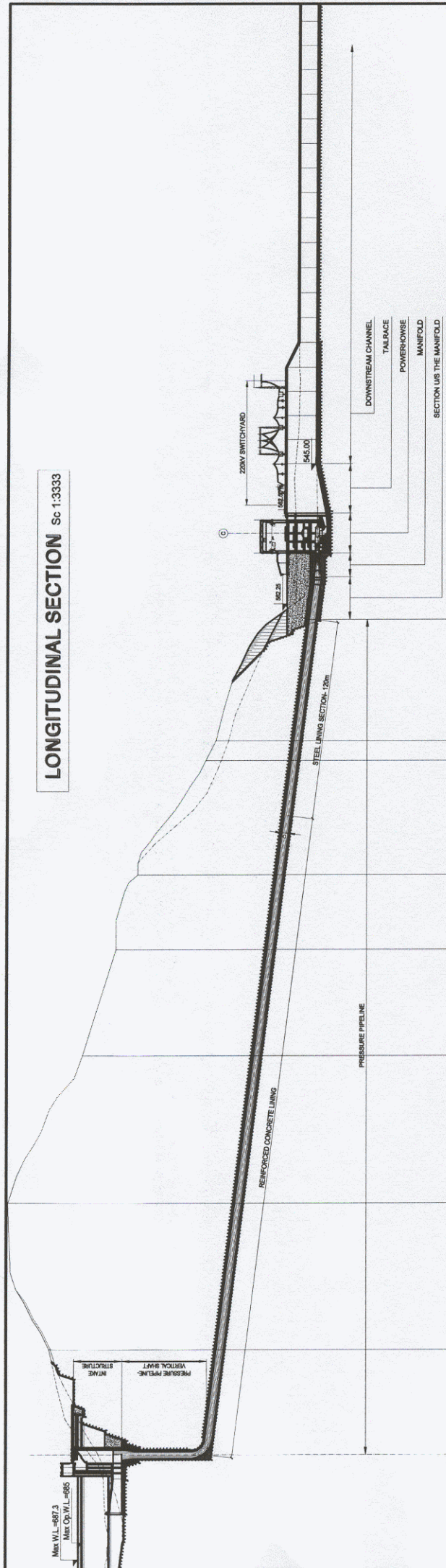
TSANKOV KAMAK HPP SCHEMATIC LAYOUT

ENERGOPROEKT - PLC
HYDROPOWER DIVISION

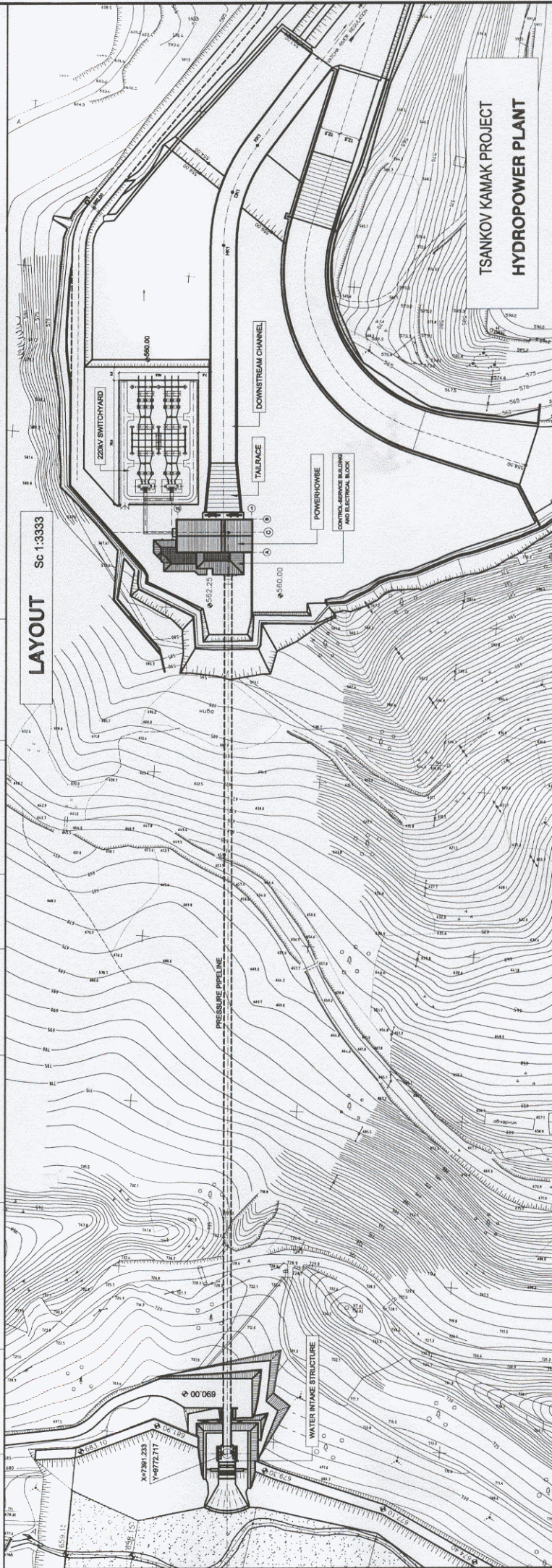




LONGITUDINAL SECTION Sc 1:3333



LAYOUT Sc 1:3333



TSANKOV KAMAK PROJECT
HYDROPOWER PLANT